

# [Underwater vacuum and sterilization system]

## Abstract

An underwater vacuum, cleaning, removal, and sterilization system that allows for the submersible cleaning and sterilization of interior surfaces of drinking water storage, treatment, and distribution facilities. The system allows for the cleaning and chemical sterilization of surfaces in an underwater environment while simultaneously removing the sterilization chemical to prevent the said sterilization chemical from impacting or increasing the optimum sterilization chemical concentration in the surrounding water. The underwater vacuum, cleaning, and sterilization system includes a housing 24 having an opening 46 which is positioned adjacent the surface to be cleaned and sterilized. The system also includes a containment chamber 55 inside said housing. The containment chamber is open on the top and bottom and more than one flexible member, seal or plurality of bristles or brushes thereby defining a circumferential seal 63 on the bottom which is fluidly connected to both the interior cavity and the interior of the vacuum housing for assuring that all of the cleaning and steriliza-

tion fluids and any other matter are removed from the cavity and do not leak therefrom. The system also includes a variable-pressure-fluid mechanism inside the housing and containment chamber for providing a variable-pressure fluid flow against the surface to be cleaned and sterilized. The mechanism includes pressure jets 53 or spray portals from which variable pressure water and sterilization chemical flow to remove debris or material from the surface being cleaned and sterilized. A turbine energized by water flow through the vacuum powers the rear wheels inside the housing. In addition the system includes vacuum or water suction for removing all of the cleaning fluid and sterilization chemical and coatings, debris, or any other matter from the cavity. The housing has a water outlet 42 which communicates with a pump or siphon at the surface of the water. The vacuum has two rear wheels that are adjustably attached to the interior of the housing with a rotatable axle between each wheel and with a sprocket attached to a chain drive powered by said turbine motor, and two front wheels that are adjustably attached to the interior of the housing. The underwater vacuum, cleaning, removal, and sterilization system can remove sediment and other debris from a water storage reservoir while simultaneously sterilizing the surfaces without causing turbidity in or allowing the sterilization chemical to enter the water column. In one of the embodiments a rotatable

brush 32 is supported inside the housing, which is also powered by the turbine motor, which may assist the cleaning process for some applications. In some of the embodiments the system includes handheld water suction and variable pressure fluid jet tools that are not powered by a turbine and are held by hand against smaller surfaces, roof support column bases, in corners, wall to floor joints, or any other area not reachable by the large turbine powered embodiment for cleaning and sterilization of said surfaces. The hand held embodiments may or may not have wheels or brushes. In some additional embodiments air lift or fluid pressure driven water suction and variable pressure fluid flow tools are designed to clean and sterilize the exterior surfaces of roof support columns or pipes and the interior surfaces of pipes.